

PCTWORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : A61K 31/70 // (A61K 31/70, 31:70, 31:495)	A1	(11) International Publication Number: WO 96/23509
		(43) International Publication Date: 8 August 1996 (08.08.96)

(21) International Application Number: **PCT/US96/01417**

(22) International Filing Date: 29 January 1996 (29.01.96)

(30) Priority Data:
382,113 1 February 1995 (01.02.95) **US**(71) Applicant: **MERCK & CO., INC.** [US/US]; 126 East Lincoln Avenue, Rahway, NJ 07065 (US).(72) Inventors: **CHODAKEWITZ, Jeffrey, A.**; 126 East Lincoln Avenue, Rahway, NJ 07065 (US). **EMINI, Emilio, A.**; 126 East Lincoln Avenue, Rahway, NJ 07065 (US).(74) Common Representative: **MERCK & CO., INC.**; 126 East Lincoln Avenue, Rahway, NJ 07065 (US).(81) Designated States: **AL, AM, AU, AZ, BB, BG, BR, BY, CA, CN, CZ, EE, FI, GE, HU, IS, JP, KG, KR, KZ, LK, LR, LT, LV, MD, MG, MK, MN, MX, NO, NZ, PL, RO, RU, SG, SI, SK, TJ, TM, TR, TT, UA, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AZ, BY, KG, KZ, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).****Published***With international search report.**Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.*(54) Title: **COMBINATION THERAPY FOR HIV INFECTION USING THE HIV PROTEASE INHIBITOR INDINAVIR AND THE REVERSE TRANSCRIPTASE INHIBITOR 3TC, OPTIONALLY TOGETHER WITH AZT, DDI OR DDC**

(57) Abstract

The combination of the HIV protease inhibitor Compound I, 3TC, and, optionally AZT, ddi, or ddC, is useful in the inhibition of HIV protease, the inhibition of HIV reverse transcriptase, the prevention or treatment of infection by HIV and the treatment of AIDS, either as compounds, pharmaceutically acceptable salts, pharmaceutical composition ingredients, whether or not in combination with other antivirals, immunomodulators, antibiotics or vaccines. Methods of treating AIDS and methods of preventing or treating infection by HIV are also described.

BEST AVAILABLE COPY

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AM	Armenia	GB	United Kingdom	MW	Malawi
AT	Austria	GE	Georgia	MX	Mexico
AU	Australia	GN	Guinea	NE	Niger
BB	Barbados	GR	Greece	NL	Netherlands
BE	Belgium	HU	Hungary	NO	Norway
BF	Burkina Faso	IE	Ireland	NZ	New Zealand
BG	Bulgaria	IT	Italy	PL	Poland
BJ	Benin	JP	Japan	PT	Portugal
BR	Brazil	KE	Kenya	RO	Romania
BY	Belarus	KG	Kyrgyzstan	RU	Russian Federation
CA	Canada	KP	Democratic People's Republic of Korea	SD	Sudan
CF	Central African Republic	KR	Republic of Korea	SE	Sweden
CG	Congo	KZ	Kazakhstan	SG	Singapore
CH	Switzerland	LJ	Liechtenstein	SI	Slovenia
CI	Côte d'Ivoire	LK	Sri Lanka	SK	Slovakia
CM	Cameroon	LR	Liberia	SN	Senegal
CN	China	LT	Lithuania	SZ	Swaziland
CS	Czechoslovakia	LU	Luxembourg	TD	Chad
CZ	Czech Republic	LV	Latvia	TG	Togo
DE	Germany	MC	Monaco	TJ	Tajikistan
DK	Denmark	MD	Republic of Moldova	TT	Trinidad and Tobago
EE	Estonia	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	UG	Uganda
FI	Finland	MN	Mongolia	US	United States of America
FR	France	MR	Mauritania	UZ	Uzbekistan
GA	Gabon			VN	Viet Nam

- 1 -

COMBINATION THERAPY FOR HIV INFECTION USING THE HIV PROTEASE INHIBITOR INDINAVIR AND THE REVERSE TRANSCRIPTASE INHIBITOR 3TC, OPTIONALLY TOGETHER WITH AZT, DDZ OR DDC.

FIELD OF THE INVENTION

5 The combination in this invention is useful in the inhibition of HIV protease, the inhibition of HIV reverse transcriptase, the treatment of infection by HIV and in the treatment of AIDS and/or ARC (i.e., AIDS related complex), either as compounds, pharmaceutically acceptable salts or esters (when appropriate), pharmaceutical composition ingredients,
10 whether or not in combination with other antivirals, anti-infectives, immunomodulators, antibiotics or vaccines. Methods of treating AIDS, methods of preventing infection by HIV, and methods of treating infection by HIV are also disclosed.

15 BACKGROUND OF THE INVENTION

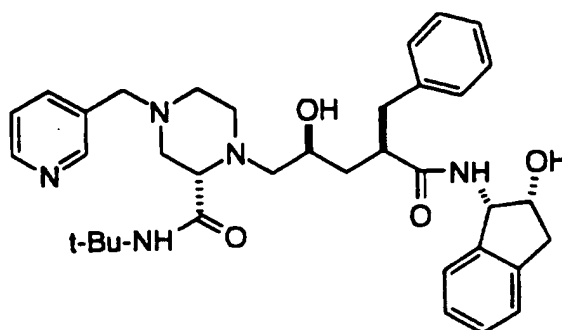
 A retrovirus designated human immunodeficiency virus (HIV) is the etiological agent of the complex disease that includes progressive destruction of the immune system (acquired immune deficiency syndrome; AIDS) and degeneration of the central and
20 peripheral nervous system. This virus was previously known as LAV, HTLV-III, or ARV. A common feature of retrovirus replication is the extensive post-translational processing of precursor polyproteins by a virally encoded protease to generate mature viral proteins required for virus assembly and function. Inhibition of this processing prevents the
25 production of normally infectious virus. For example, Kohl, N.E. *et al.*, *Proc. Nat'l Acad. Sci.*, 85, 4686 (1988), demonstrated that genetic inactivation of the HIV encoded protease resulted in the production of immature, non-infectious virus particles. These results indicate that inhibition of the HIV protease represents a viable method for the
30 treatment of AIDS and the prevention or treatment of infection by HIV.

 Nucleotide sequencing of HIV shows the presence of a pol gene in one open reading frame [Ratner, L. *et al.*, *Nature*, 313, 277 (1985)]. Amino acid sequence homology provides evidence that the pol sequence encodes reverse transcriptase, an endonuclease and an HIV

- 2 -

protease [Toh, H. *et al.*, *EMBO J.*, 4, 1267 (1985); Power, M.D. *et al.*, *Science*, 231, 1567 (1986); Pearl, L.H. *et al.*, *Nature*, 329, 351 (1987)].

The compound disclosed and referred to as "Compound J" in EPO 541,168, which published on May 12, 1993, is a potent inhibitor of HIV protease and is useful in the prevention of infection by HIV, the
5 treatment of infection by HIV and the treatment of AIDS or ARC, without significant side effects or toxicity:



or pharmaceutically acceptable salts thereof,

10

Compound J

One substantial and persistent problem in the treatment of AIDS has been the ability of the HIV virus to develop resistance to the
15 individual therapeutic agents employed to treat the disease. To solve this problem, a combination therapy for AIDS has been discovered by applicants.

Applicants demonstrate that the combination of compounds of this invention is useful in the treatment of HIV infection.

20 In the present invention, applicants co-administer the potent HIV protease inhibitor Compound J with the nucleoside HIV reverse transcriptase inhibitor 3TC. Optionally, a third component which is a nucleoside inhibitor of HIV reverse transcriptase, such as AZT, ddI or ddC, is added to the combination. This combination therapy is a method
25 to enhance the effectiveness in treating AIDS and to preclude the development of resistance to the individual therapeutic agents.

- 3 -

SUMMARY OF THE INVENTION

The present invention involves a combination of Compound J and the nucleoside analog HIV reverse transcriptase inhibitor 3TC, and, optionally, a nucleoside inhibitor of HIV reverse transcriptase selected from AZT, ddI or ddC, or a pharmaceutically acceptable salt or ester thereof.

DETAILED DESCRIPTION OF THE INVENTION AND PREFERRED EMBODIMENTS

This invention is concerned with the combination of certain compounds, or pharmaceutically acceptable salts thereof, in the inhibition of HIV protease, the inhibition of HIV reverse transcriptase, the prevention or treatment of infection by HIV and in the treatment of the resulting acquired immune deficiency syndrome (AIDS). The combination is defined as follows:

A combination of compounds, which is Compound J and the nucleoside analog, HIV reverse transcriptase inhibitor 3TC, and, optionally a nucleoside inhibitor of HIV reverse transcriptase selected from AZT, ddI and ARC, or pharmaceutically acceptable salt or ester thereof.

One preferred combination involves the combination of Compound J and 3TC and AZT, administered simultaneously.

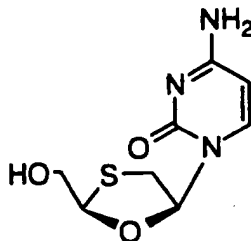
Another preferred combination involves the combination of Compound J, 3TC and AZT, administered alternatively.

Another preferred combination is compound J and the nucleoside inhibitor of HIV reverse transcriptase 3TC, or pharmaceutically acceptable salts thereof.

The HIV protease inhibitor Compound J is synthesized by the protocol of EP 0 541 168, published 12 May 1993. Compound J is N-(2(R)-hydroxy-1(S)-indanyl)-2(R)-phenylmethyl-4-(S)-hydroxy-5-(1-(4-(3-pyridylmethyl)-2(S)-N'-(t-butyl-carboxamido)-piperazinyl))-pentanemide, or pharmaceutically acceptable salt thereof.

The nucleoside analog 3TC has the structure

- 4 -



It is synthesized by the methods of C.K. Chu *et al.*, *J. Org. Chem.* 56, 6503 (1991); W.B. Choi *et al.*, *J. Am. Chem. Soc.* 113, 9377 (1991); L. Houng *et al.*, *J. Org. Chem.* 57, 5563 (1992); R.F. Schinazi *et al.*,
5 *Antimicrob. Agents Chemother.* 36, 672 (1992); P.A. Furman *et al.*,
Antimicrob. Agents Chemother. 36, 2686 (1992), EP 0494119 and WO 91/11186.

The pharmaceutically acceptable salts of the present invention (in the form of water- or oil-soluble or dispersible products)
10 include the conventional non-toxic salts or the quaternary ammonium salts which are formed, e.g., from inorganic or organic acids or bases. Examples of such acid addition salts include acetate, adipate, alginate, aspartate, benzoate, benzenesulfonate, bisulfate, butyrate, citrate, camphorate, camphorsulfonate, cyclopentanepropionate, digluconate,
15 dodecylsulfate, ethanesulfonate, fumarate, glucoheptanoate, glycerophosphate, hemisulfate, heptanoate, hexanoate, hydrochloride, hydrobromide, hydroiodide, 2-hydroxyethanesulfonate, lactate, maleate, methanesulfonate, 2-naphthalenesulfonate, nicotinate, oxalate, pamoate, pectinate, persulfate, 3-phenylpropionate, picrate, pivalate, propionate,
20 succinate, tartrate, thiocyanate, tosylate, and undecanoate. Base salts include ammonium salts, alkali metal salts such as sodium and potassium salts, alkaline earth metal salts such as calcium and magnesium salts, salts with organic bases such as dicyclohexylamine salts, N-methyl-D-glucamine, and salts with amino acids such as arginine, lysine, and so
25 forth. Also, the basic nitrogen-containing groups may be quaternized with such agents as lower alkyl halides, such as methyl, ethyl, propyl, and butyl chloride, bromides and iodides; dialkyl sulfates like dimethyl, diethyl, dibutyl; and diamyl sulfates, long chain halides such as decyl, lauryl, myristyl and stearyl chlorides, bromides and iodides, aralkyl

- 5 -

halides like benzyl and phenethyl bromides and others. Other pharmaceutically acceptable salts include the sulfate salt ethanolate and sulfate salts.

5 The pharmaceutically acceptable salts of the combination of the instant invention include the combination wherein one of the individual components is in the form of a pharmaceutically acceptable salt, or the combination wherein all of the individual components are in the form of pharmaceutically acceptable salts, or a pharmaceutically acceptable salt of the combined components (i.e., a salt of the
10 combination). In one embodiment of the present invention, the sulfate salt of the combination is utilized.

The pharmaceutically acceptable esters in the present invention refer to non-toxic esters, preferably the alkyl esters such as methyl, ethyl, propyl, isopropyl, butyl, isobutyl or pentyl esters, of which
15 the methyl ester is preferred. However, other esters such as phenyl-C₁₋₅ alkyl may be employed if desired.

Esterification of alcohols, such as Compound J of the present invention, is performed by a variety of conventional procedures, including reacting the alcohol group with the appropriate anhydride,
20 carboxylic acid or acid chloride. These reactions, as well as other methods of esterification of alcohols, are readily apparent to the skilled artisan.

Reaction of the alcohol with the appropriate anhydride is carried out in the presence of an acylation catalyst, such as 4-DMAP (4-dimethylaminopyridine, also known as N,N-dimethylaminopyridine),
25 pyridine, or 1,8-bis[dimethylamino]naphthalene.

Reaction of the alcohol with the appropriate carboxylic acid is carried out in the presence of a dehydrating agent and, optionally, an acylation catalyst. The dehydrating agent, which serves to drive the
30 reaction by the removal of water is selected from dicyclohexylcarbodiimide (DCC), 1-[3-dimethylaminopropyl]-3-ethylcarbodiimide (EDC) or other water soluble dehydrating agents.

Alternatively, reaction of the alcohol with appropriate carboxylic acid can also result in esterification, if performed instead in

- 6 -

the presence of trifluoroacetic anhydride, and, optionally, pyridine. A further variant is reacting the alcohol with appropriate carboxylic acid in the presence of N,N-carbonyldiimidazole with pyridine.

5 Reaction of the alcohol with the acid chloride is carried out with an acylation catalyst, such as 4-DMAP or pyridine.

10 Selective esterification of Compound J is performed by a variety of methods known to the skilled artisan. In one method, the alcohol is first esterified with a trichloroethyl derivative (e.g., mono-trichloroethyl succinate). After chromatographic isolation of the preferred ester, reductive elimination of the trichloroethyl group is carried out by reaction with zinc dust in acetic acid. Alternatively, another method of selective esterification is the hydrolysis of the bis-ester.

15 The combination of compounds of the present invention is useful in the inhibition of HIV protease, the inhibition of HIV reverse transcriptase, the prevention or treatment of infection by human immunodeficiency virus (HIV) and the treatment of consequent pathological conditions such as AIDS. Treating AIDS or preventing or treating infection by HIV is defined as including, but not limited to, 20 treating a wide range of states of HIV infection: AIDS, ARC, both symptomatic and asymptomatic, and actual or potential exposure to HIV. For example, the compounds of this invention are useful in treating infection by HIV after suspected past exposure to HIV by e.g., blood transfusion, exchange of body fluids, bites, accidental needle stick, or 25 exposure to patient blood during surgery.

For these purposes, the combinations of the present invention may be administered orally, parenterally (including subcutaneous injections, intravenous, intramuscular, intrasternal injection or infusion techniques), by inhalation spray, or rectally, in dosage unit 30 formulations containing conventional non-toxic pharmaceutically acceptable carriers, adjuvants and vehicles.

Thus, in accordance with the present invention there is further provided a method of treating and a pharmaceutical composition for treating HIV infection and AIDS. The treatment involves

- 7 -

administering to a patient in need of such treatment a pharmaceutical composition comprising a pharmaceutical carrier and a therapeutically effective amount of each compound in the combination of the present invention.

5 These pharmaceutical compositions may be in the form of orally-administrable suspensions or tablets; nasal sprays; sterile injectable preparations, for example, as sterile injectable aqueous or oleaginous suspensions or suppositories.

10 In accordance with the method of the present invention, the individual components of the combination can be administered separately at different times during the course of therapy or concurrently in divided or single combination forms. For example, in a two-component combination which is the HIV protease inhibitor, Compound J, and the nucleoside HIV reverse transcriptase 3TC, treatment with 3TC can
15 commence prior to, subsequent to or concurrent with commencement of treatment with Compound J. The instant invention is therefore to be understood as embracing all such regimes of simultaneous or alternating treatment and the term "administering" is to be interpreted accordingly.

20 When administered orally as a suspension, these compositions are prepared according to techniques well-known in the art of pharmaceutical formulation and may contain microcrystalline cellulose for imparting bulk, alginic acid or sodium alginate as a suspending agent, methylcellulose as a viscosity enhancer, and sweeteners/flavoring agents known in the art. As immediate release tablets, these compositions may
25 contain microcrystalline cellulose, dicalcium phosphate, starch, magnesium stearate and lactose and/or other excipients, binders, extenders, disintegrants, diluents and lubricants known in the art.

30 When administered by nasal aerosol or inhalation, these compositions are prepared according to techniques well-known in the art of pharmaceutical formulation and may be prepared as solutions in saline, employing benzyl alcohol or other suitable preservatives, absorption promoters to enhance bioavailability, fluorocarbons, and/or other solubilizing or dispersing agents known in the art.

- 8 -

The injectable solutions or suspensions may be formulated according to known art, using suitable non-toxic, parenterally-acceptable diluents or solvents, such as mannitol, 1,3-butanediol, water, Ringer's solution or isotonic sodium chloride solution, or suitable dispersing or wetting and suspending agents, such as sterile, bland, fixed oils, including synthetic mono- or diglycerides, and fatty acids, including oleic acid.

When rectally administered in the form of suppositories, these compositions may be prepared by mixing the drug with a suitable non-irritating excipient, such as cocoa butter, synthetic glyceride esters or polyethylene glycols, which are solid at ordinary temperatures, but liquify and/or dissolve in the rectal cavity to release the drug.

The compounds of this invention can be administered to humans in the dosage ranges specific for each compound. Compound J, or a pharmaceutically acceptable salt thereof, is administered orally in a dosage range between about 40 mg and about 4000 mg per day, divided into between one and four doses per day. One preferred dosage range for Compound J is between about 300 mg and about 1200 mg every 8 hours. One preferred dosage range of AZT (zidovudine) is between about 50 mg and about 600 mg every 8 hours. One preferred dosage range of 3TC is between about 20 mg and about 500 mg twice daily. It will be understood, however, that the specific dose level and frequency of dosage for any particular patient may be varied and will depend upon a variety of factors including the activity of the specific compound employed, the metabolic stability and length of action of that compound, the age, body weight, general health, sex, diet, mode and time of administration, rate of excretion, drug combination, the severity of the particular condition, and the host undergoing therapy.

The combination of the present invention can also be combined with an optional third antiviral component which is a nucleoside inhibitor of HIV reverse transcriptase. For example, the combination of this invention may be effectively administered, whether at periods of pre-exposure and/or past exposure, in combination with effective amounts of the AIDS antivirals AZT, ddI or ddC, known to those of ordinary skill in the art.

- 9 -

TABLE 1Antivirals

5

<u>Drug Name</u>	<u>Manufacturer</u>	<u>Indication</u>
ddI Dideoxyinosine	Bristol-Myers (New York, NY)	AIDS, ARC
ddC Dideoxycytidine	Hoffman-LaRoche (Nutley, NJ)	AIDS, ARC
Zidovudine, AZT	Burroughs-Wellcome (Research Triangle Park)	AIDS, adv, ARC, pediatric AIDS, Kaposi's sarcoma, asymptomatic HIV infection, less severe HIV disease, neuro- logical involvement, in combination with other therapies

AZT is synthesized by the methods of J.P. Horwitz *et al.*, *J. Org. Chem.*, 29, 2076 (1964); R.P. Glinski *et al.*, *J. Org. Chem.*, 38, 4299 (1973); and C.K. Chu *et al.*, *Tetrahedron Letters*, 29, 5349 (1988). Application of AZT as a therapeutic drug in the treatment of AIDS is disclosed in U.S. Patent No. 4,724,232.

The compound ddC is synthesized by the methods of J.P. Horwitz *et al.*, *J. Org. Chem.*, 32, 817 (1967); R. Marumoto and M. Honjo, *Chem. Pharm. Bull.*, 22, 128 (1974); and T-S. Lin *et al.*, *J. Med. Chem.*, 30, 440 (1987). Application of ddC as a therapeutic drug in the treatment of AIDS is disclosed in U.S. Patent Nos. 4,879,277 and 5,028,595.

- 10 -

The compound ddI is synthesized by the methods of U.S. Patent No. 5,011,774; and V. Bhat *et al.*, *Synthetic Commun.*, 22(10), 1481-86 (1992). Application of ddI as a therapeutic drug in the treatment of AIDS is disclosed in U.S. Patent No. 5,254,539.

5 Preferred combinations are simultaneous or alternating treatments of an inhibitor of HIV protease and a non-nucleoside inhibitor of HIV reverse transcriptase. An optional third component in the instant combination is a nucleoside inhibitor of HIV reverse transcriptase, such as AZT, ddC or ddI. These combinations may have synergistic effects on
10 limiting the spread of HIV. Thus, the present invention includes triple combinations of the HIV protease inhibitor Compound J, with the nucleoside HIV reverse transcriptase inhibitor 3TC and a nucleoside HIV reverse transcriptase inhibitor selected from AZT, ddI or ddC. For such triple combinations, treatments may be simultaneous, alternating or both
15 simultaneous and alternating.

EXAMPLE 1

Protocol for the combination therapy of Compound J, AZT and 3TC

20 In one sample, approximately 90 HIV-1 seropositive male or female adults 18 years of age or older are treated. The patients may have previous treatment with zidovudine for more than or equal to about six months. Their CD4 counts are between about 50 and 400 cells/mm³ and serum viral RNA levels of more than or equal to about 20,000
25 copies/mL. The primary objective to the protocol is to administer Compound J at 800 mg q8h in combination with zidovudine 200 mg q8h and 3TC 150 mg twice daily.

- 11 -

DOSAGE/DOSAGE FORM, ROUTE, AND DOSE REGIMEN

Group	N	Treatment [Dose]		
1	30	J [800 mg q8h]	AZT [200 mg q8h]	3TC [150 mg b.i.d.]
2	30	Placebo to J	AZT [200 mg q8h]	3TC [150 mg b.i.d.]
3	30	J [800 mg q8h]	Placebo to AZT	Placebo to 3TC

EXAMPLE 2

5

Protocol for the combination therapy of Compound J and 3TC

In one sample, approximately 90 HIV-1 seropositive male or female adults 18 years of age or older are treated. The patients may have previous treatment with zidovudine for more than or equal to about six months. Their CD4 counts are between about 50 and 400 cells/mm³ and serum viral RNA levels of more than or equal to about 20,000 copies/mL. The primary objective to the protocol is to administer Compound J at 800 mg q8h in combination with 3TC 150 mg twice daily.

15

DOSAGE/DOSAGE FORM, ROUTE, AND DOSE REGIMEN

Group	N	Treatment [Dose]	
1	30	J [800 mg q8h]	3TC [150 mg b.i.d.]
2	30	Placebo to J	3TC [150 mg b.i.d.]
3	30	J [800 mg q8h]	Placebo to 3TC

- 12 -

While the foregoing specification teaches the principles of the present invention, with examples provided for the purpose of illustration, it will be understood that the practice of the invention encompasses all of the usual variations, adaptations, or modifications, as
5 come within the scope of the following claims and its equivalents.

- 13 -

WHAT IS CLAIMED IS:

1. A combination of compounds, which is Compound J and the nucleoside analog HIV reverse transcriptase inhibitor 3TC, and, optionally, a nucleoside inhibitor of HIV reverse transcriptase selected from AZT, ddI or ddC, or a pharmaceutically acceptable salt or ester thereof.
2. The combination of Claim 1, which is Compound J and 3TC.
3. The combination of Claim 1, which is Compound J and 3TC and AZT.
4. The combination of Claim 1, which is Compound J and 3TC and ddI.
5. The combination of Claim 1, which is Compound J and 3TC and ddC.
6. The combination of Compound J and 3TC and AZT, administered simultaneously.
7. The combination of Compound J and 3TC and AZT, administered alternatively.
8. A method of inhibiting HIV protease, comprising administering to a suitable mammal in need of such treatment an effective amount of the combination of Claim 1.
9. A method of inhibiting HIV reverse transcriptase, comprising administering to a suitable mammal in need of such treatment an effective amount of the combination of Claim 1.

- 14 -

10. A method of preventing infection of HIV, or of treating infection by HIV, or of treating AIDS or ARC, comprising administering to a suitable mammal in need of such treatment an effective amount of the combination of Claim 1.

5

11. A pharmaceutical composition useful for inhibiting HIV protease, comprising an effective amount of the combination of Claim 1, and a pharmaceutically acceptable carrier.

10

12. A pharmaceutical composition useful for inhibiting HIV reverse transcriptase, comprising an effective amount of the combination of Claim 1, and a pharmaceutically acceptable carrier.

15

13. A pharmaceutical composition useful for preventing or treating infection of HIV, or for treating AIDS or ARC, comprising an effective amount of the combination of Claim 1, and a pharmaceutically acceptable carrier.

INTERNATIONAL SEARCH REPORT

In national Application No
PCT/US 96/01417

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61K31/70 //(A61K31/70,31:70,31:495)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,Y	PROC. NATL. ACAD. SCI. USA, vol. 91, no. 9, 1994, pages 4096-40100, XP002007218 J.P. VACCA ET AL.: "L-735,524: An orally bioavailable human immunodeficiency virus type 1 protease inhibitor" see the whole document ---	1-13
X,Y	EP,A,0 617 968 (MERCK & CO INC) 5 October 1994 see the whole document see page 43 - page 54 ---	1-13
-/--		

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

2 July 1996

Date of mailing of the international search report

15.07.96

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl,
Fax (+ 31-70) 340-3016

Authorized officer

Stierman, B

INTERNATIONAL SEARCH REPORT

In International Application No

PCT/US 96/01417

C/(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,Y	<p>DATABASE AIDSLINE Host Dialog, abstract no. 95700044, 1994 "Protease inhibitors - an update" XP002007224 see abstract & CRIT PATH AIDS PROJ, vol. 94, no. 30, 1994, USA, pages 26-28,</p> <p>---</p>	1-13
X,Y	<p>WO,A,94 26717 (MERCK & CO INC) 24 November 1994 see the whole document see page 59 - page 71</p> <p>---</p>	1-13
X,Y	<p>J ACQUIR IMMUNE DEFIC SYNDR HUM RETROVIROL, vol. 10, no. suppl. 2, 1995, pages s83-s91, XP002007219 M. H. ST. CLAIR ET AL.: "In vitro comparison of selected triple-drug combinations for suppression of HIV-1 replication: The inter-company collaboration protocol" see the whole document see table 2</p> <p>---</p>	1-13
P,X, Y	<p>WO,A,96 00068 (MERCK & CO INC) 4 January 1996 see the whole document</p> <p>---</p>	1-13
P,X, Y	<p>J INT ASSOC PHYSICIANS AIDS CARE, vol. 1, no. 8, September 1995, USA, pages 10-20,22, XP002007220 M. MASCOLINI: "A Lisbon Traviata. Are clinicians ready to sing addio to monotherapy and libiamo to combinations?" see the whole document see page 12</p> <p>---</p>	1-13
P,X, Y	<p>DATABASE AIDSLINE Host Dialog, abstract no. 96700812, 1995 "Another option for less than 50 T4 cells" XP002007225 see abstract & TREAT REV, no. 19, August 1995, page 3</p> <p>---</p>	1-13

-/--

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 96/01417

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	<p>INT CONF AIDS, vol. 9, no. 1, June 1993, page 227 XP002007221 K.T. CHONG ET AL.: "Synergistic inhibition of HIV replication in vitro by U-90152 (BHAP) and protease inhibitor, U-75875" see abstr. no. P0-A25-0557 ---</p>	1-13
Y	<p>INT CONF AIDS, vol. 9, no. 1, 1993, page 236 XP002007222 K.C. VINER ET AL.: "(-)Enantiomeric 2'-Deoxy-3'-thiacytidine (3TC) in combination with AZT synergistically inhibits clinical isolates of HIV-1" see abstr. no. P0-A25-0607 ---</p>	1-13
Y	<p>ANTIVIRAL RES, vol. 21, no. 4, 1993, pages 327-342, XP002007223 D.M. LAMBERT ET AL.: see the whole document -----</p>	1-13

INTERNATIONAL SEARCH REPORT

I national application No.

PCT/US96/01417

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
Remark: Although claims 8-10 are directed to a method of treatment of the human/animal body, the search has been carried out and based on the alleged effects of the compound/composition.
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 96/01417

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A-0617968	05-10-94	AU-B- 5921394	06-10-94
		BR-A- 9406503	02-01-96
		CA-A- 2120192	01-10-94
		FI-A- 954580	27-09-95
		NO-A- 953876	30-11-95
		PL-A- 310895	08-01-96
		US-A- 5413999	09-05-95
		WO-A- 9422480	13-10-94
		US-A- 5527799	18-06-96
		ZA-A- 9402255	01-11-94

WO-A-9426717	24-11-94	US-A- 5413999	09-05-95
		AU-B- 6669294	12-12-94
		BR-A- 9406576	30-01-96
		CA-A- 2161334	24-11-94
		EP-A- 0696277	14-02-96
		FI-A- 955315	06-11-95
		NO-A- 954427	08-01-96
		PL-A- 311635	04-03-96
		US-A- 5527799	18-06-96
		ZA-A- 9403104	06-11-95

WO-A-9600068	04-01-96	AU-B- 2863895	19-01-96

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☐ FADED TEXT OR DRAWING
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☒ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.